

**FIRST FIVE-YEAR REVIEW REPORT FOR
VENTRON/VELSICOL SUPERFUND SITE
BERGEN COUNTY, NEW JERSEY**



Prepared by

**U.S. Environmental Protection Agency
Region 2
New York, New York**

A handwritten signature in black ink, appearing to read "A. Carpenter".

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9.25.17

Date

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LIST OF ABBREVIATIONS & ACRONYMS

| | |
|---------|---|
| ARAR | Applicable or Relevant and Appropriate Requirement |
| BCSA | Berry's Creek Study Area |
| CEA | Classification Exception Area |
| CERCLA | Comprehensive Environmental Response, Compensation, and Liability Act |
| CFR | Code of Federal Regulations |
| EPA | United States Environmental Protection Agency |
| FYR | Five-Year Review |
| ICs | Institutional Controls |
| NCP | National Oil and Hazardous Substances Pollution Contingency Plan |
| NJDEP | New Jersey Department of Environmental Protection |
| NPL | National Priorities List |
| NRDCSCC | New Jersey Non-Residential Direct Contact Soil Cleanup Criteria |
| O&M | Operation and Maintenance |
| PRP | Potentially Responsible Party |
| RAO | Remedial Action Objective |
| RDCSCC | New Jersey Residential Direct Contact Soil Cleanup Criteria |
| ROD | Record of Decision |
| RPM | Remedial Project Manager |
| TBC | To be considered |
| WRA | Well Restriction Area |

I. INTRODUCTION

The purpose of a five-year review (FYR) is to evaluate the implementation and performance of a remedy in order to determine if the remedy is and will continue to be protective of human health and the environment. The methods, findings, and conclusions of reviews are documented in FYR reports such as this one. In addition, FYR reports identify issues found during the review, if any, and document recommendations to address them.

The U.S. Environmental Protection Agency (EPA) is preparing this FYR review pursuant to the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) Section 121, consistent with the National Contingency Plan (NCP)(40 CFR Section 300.430(f)(4)(ii)), and considering EPA policy.

This is the first FYR for the Ventron/Velsicol Superfund Site. The triggering action for this statutory review is the on-site construction start date of the OU1 remedial action. The FYR has been prepared due to the fact that hazardous substances, pollutants or contaminants remain at the site above levels that allow for unlimited use and unrestricted exposure (UU/UE).

The Site consists of two OUs, and one OU will be addressed in this FYR. OU1 addresses the upland portion of the site. The OU that is not addressed in this FYR is OU2 (a.k.a., the Berry's Creek Study Area) which is not included in this FYR because it does not have a Record of Decision (ROD).

The Ventron/Velsicol Superfund Site FYR was led by Douglas Tomchuk, USEPA. Participants included Michael Scorca - hydrogeologist, Lora Smith-Staines – human health risk assessor, Michael Clemetson – ecological risk assessor, and Sophia Rini – community involvement coordinator. The FYR was also discussed with Gwen Zervas, the project manager for the New Jersey Department of Environmental Protection (NJDEP). Robert Casselberry of Dow Chemical (representing Morton International, a corporate successor to Ventron Corporation) was notified of the initiation of the five-year review. The review began on November 7, 2016.

Site Background

From 1927 to 1974, a mercury processing plant operated at the Ventron/Velsicol site, which is located in an industrial/commercial area in the boroughs of Wood-Ridge and Carlstadt, New Jersey. The site consists of 38.3 acres; approximately 15.7 acres are within the Borough of Wood-Ridge and the remaining 22.6 acres are within the Borough of Carlstadt. The site is bordered to the east by Berry's Creek, to the west by the Diamond Shamrock/Henkel and Randolph Products properties and Park Place East, to the south by Diamond Shamrock/Henkel Ditch (south) and Nevertouch Creek, and to the north by Ethel Boulevard and a railroad track (see, Figure 1).

The portion of the site identified as OU1 is divided into three areas. The area defined as the "developed" portion is approximately 7 acres in size and is the northwest portion of the site. The main operations of the plant were conducted here and included the manufacturing of various organic and inorganic mercury compounds. The plant also reclaimed mercury from both in-house and customer waste products (amalgams, batteries, thermometers, impure mercury, etc.). The plant was demolished in 1974 to 1975 and two warehouses, the U.S. Life Warehouse and the Wolf Warehouse, were constructed in this 7-acre portion of the site. These two warehouses are still active. Adjacent to that area, is the second area, the 19-acre "undeveloped" area, which was used as a dumping area for various materials including demolition material and domestic solid waste subsequent to 1960. Construction of a new

warehouse has been started on the previously undeveloped portion of the site. Portions of several adjacent properties that were contaminated by the site comprise the third area and are referred to as the “off-site” portion, which includes the Lin-Mor property, Ethel Boulevard, and the railroad property.

An additional 12 acres of the site, which is predominantly marsh, is being addressed as part of Operable Unit 2, which is also referred to as the Berry’s Creek Study Area. The Berry’s Creek Study Area consists of the marsh, Berry’s Creek and its tributaries, and other wetland areas adjacent to Berry’s Creek. A remedial investigation/feasibility study for the Berry’s Creek Study Area has been conducted and a Record of Decision is anticipated in 2018.

FIVE-YEAR REVIEW SUMMARY FORM

| SITE IDENTIFICATION | | |
|---|---|---|
| Site Name: Ventron/Velsicol | | |
| EPA ID: NJD980529879 | | |
| Region: 2 | State: NJ | City/County: Wood-Ridge and Carlstadt/Bergen |
| SITE STATUS | | |
| NPL Status: Final | | |
| Multiple OUs? Yes | Has the site achieved construction completion? No | |
| REVIEW STATUS | | |
| Lead agency: EPA <i>[If “Other Federal Agency”, enter Agency name]:</i> | | |
| Author name (Federal or State Project Manager): Douglas Tomchuk | | |
| Author affiliation: EPA | | |
| Review period: 11/7/2016 - 9/18/2017 | | |
| Date of site inspection: 6/29/2017 | | |
| Type of review: Statutory | | |
| Review number: 1 | | |
| Triggering action date: 3/16/2009 | | |
| Due date (five years after triggering action date): 3/16/2014 | | |

II. RESPONSE ACTION SUMMARY

Basis for Taking Action

Soil Impacts

Based on the remedial investigation, it was determined that soil at the site was impacted with various contaminants at concentrations exceeding the New Jersey Residential Direct Contact Soil Cleanup Criteria (RDCSCC) and the Non-Residential Direct Contact Soil Cleanup Criteria (NRDCSCC). The fifteen contaminants exceeding the RDCSCC and the NRDCSCC in soil (both surface and subsurface) within OU1 are: mercury (up to 34,700 mg/kg), arsenic (up to 120 mg/kg), copper (up to 2,190 mg/kg), beryllium (up to 2.1 mg/kg), benzo(a)anthracene (up to 62 mg/kg), benzo(a)pyrene (up to 52 mg/kg), benzo(b)fluoranthene (up to 64 mg/kg), benzo(k)fluoranthene (up to 4.7 mg/kg), bis(2-ethylhexyl)phthalate (up to 380 mg/kg), chrysene (up to 12 mg/kg), dibenz(a,h)anthracene (up to 1.3 mg/kg), indeno(1,2,3-cd)pyrene (up to 2.6 mg/kg), lead (up to 4,320 mg/kg), thallium (up to 21.9 mg/kg) and zinc (up to 43,200 mg/kg). By comparing concentrations of some contaminants found in on-site soils to levels found in fill material, it was determined that benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, dibenz(a,h)anthracene, indeno(1,2,3-cd)pyrene, beryllium, and zinc were related to fill and would not be considered contaminants of concern related to the site. However, remedies for this historic fill material were considered during the evaluation of soil alternatives.

With the closure of the Ventron/Velsicol operation in the early 1970s, mercury-contaminated material was buried at the site, and the Wolf Warehouse building was built over the top of it as a cap. As a result, the highest levels of contamination at the site are likely beneath this building, which was inaccessible for sampling. Information about the construction of the warehouse building suggested that a cut-off wall was installed along the downgradient (eastern) edge of the building to minimize migration of mercury-contaminated groundwater. During the RI, trenching to attempt to locate and assess the condition of this sub-surface wall was unsuccessful.

Groundwater Impacts

During the remedial investigation, wells were sampled multiple times. The following site-related contaminants were detected in groundwater at levels exceeding the New Jersey Ground Water Quality Standards: arsenic (up to 41.5 ppb), mercury (up to 22.9 ppb), and benzene (up to 14 ppb). Iron and manganese have been detected in all site monitoring wells at concentrations exceeding the New Jersey Ground Water Quality Standards during every sampling event, however, the concentrations both in upgradient and downgradient wells have not varied significantly over time. Therefore, it is believed that iron and manganese concentrations in site groundwater reflect background geochemical conditions and are not site related.

Air Sampling

Air sampling was conducted at the site to determine the concentration of gaseous and particulate mercury in ambient air at the site. Four locations were monitored in the developed area of the site (one inside the U.S. Life Warehouse, one inside the Wolf Warehouse, and two outside locations adjacent to the warehouses) and one location was monitored in the undeveloped area. The results of the sampling

showed the highest level of mercury was in the Wolf Warehouse at 129 ng/m³, which was measured in the summer 2010. The NJDEP indoor air criterion for mercury is 300 ng/m³.

Risk Evaluations

Developed Area

Future Long-term Workers: Risks and hazards were evaluated for incidental ingestion of, dermal contact with, and inhalation of contaminants from surface soil; and inhalation of volatile organic contaminants (VOCs) in indoor air from vapor intrusion from subsurface contamination. The calculated hazard index (HI) is 5.2, with exposure to mercury in the surface soil contributing most significantly to the hazard. The incremental lifetime cancer risk is within the acceptable risk range.

Future Construction Workers: Risks and hazards were evaluated for incidental ingestion of, dermal contact with, and inhalation of particulates released from subsurface soil. The calculated HI is 7.8, with exposure to mercury in the soil contributing most significantly to the hazard. The incremental lifetime cancer risk is within the acceptable risk range.

Undeveloped Area

Current/Future Adult Trespassers/Visitors: Risks and hazards were evaluated for incidental ingestion of, dermal contact with, and inhalation of particulates released from surface soil and sediments. The calculated HI is 3.8, with exposure to mercury in the soil contributing most significantly to the hazard. The incremental lifetime cancer risk is within the acceptable risk range.

Current/Future Adolescent/Pre-Adolescent Trespassers/Visitors: Risks and hazards were evaluated for incidental ingestion of, dermal contact with, and inhalation of particulates released from surface soil. The calculated HI is 5.3, with exposure to mercury in the soil contributing most significantly to the hazard. The incremental lifetime cancer risk is within the acceptable risk range.

Future Long-term Workers: Risks and hazards were evaluated for incidental ingestion of, dermal contact with, and inhalation of contaminants from surface soil; and inhalation of VOCs in indoor air from vapor intrusion from subsurface contamination. The calculated HI is 9.6, with exposure to naphthalene in indoor air from the subsurface soil contributing most significantly to the hazard. The incremental lifetime cancer risk is within the acceptable risk range.

Future Construction Workers: Risks and hazards were evaluated for incidental ingestion of, dermal contact with, and inhalation of particulates released from subsurface soil. The calculated HI is 2.8, with exposure to mercury in the soil contributing most significantly to the hazard. The incremental lifetime cancer risk is within the acceptable risk range.

Groundwater

Future Adult and Child Residents: Risks and hazards were evaluated for ingestion of groundwater, dermal contact with groundwater, and inhalation of VOCs while showering with groundwater. The estimated cancer risks are 4×10^{-4} (adult) and 2×10^{-4} (child); benzene and arsenic in the groundwater are the most significant contributors to the cancer risk. The calculated HIs are 23 (adult) and 75 (child), with mercury, benzene, and naphthalene as the most significant contributors to the hazard.

Ecological Risk Assessment (ERA)

Based on the results of the ecological risk assessment, NJDEP and EPA determined that further analysis was warranted. Alternatively, potential risks may be addressed in the feasibility study through risk management. Therefore, NJDEP and EPA decided that further analysis for Operable Unit 1 was not required and that the risk to ecological receptors would be addressed in the feasibility study by evaluating remedies that would prevent the contact of ecological receptors with contamination. The response action selected in the ROD prevents contact by requiring excavation of contaminated soil in the buffer areas and capping the remaining soil.

Response Actions

On October 30, 2006, a Record of Decision (ROD) for OU1 was signed, with NJDEP as the lead agency, with the following Remedial Action Objectives (RAOs):

- Prevent/minimize potential migration of contaminants in surface soil via windblown dust and surface runoff to the marsh area and Berry's Creek;
- Prevent/minimize potential migration of contaminants to groundwater, which may discharge to surface water and sediment;
- Prevent/minimize potential migration of contaminants in on-site sediments via surface runoff to the marsh area and Berry's Creek;
- Reduce human and ecological receptor's potential exposure to contaminants in surface soil to within acceptable risk levels;
- Reduce exposure to contaminants in soil in the undeveloped area to allow for reasonable anticipated future land use;
- Prevent/minimize the potential downgradient and off-site migration of contaminated groundwater to the marsh area and Berry's Creek;
- Reduce human and ecological receptor's potential exposure to contaminants in groundwater to within acceptable risk levels.

The remediation goals for soil are the New Jersey Soil Cleanup Criteria. A summary of these criteria can be found in Table 1, below. The remediation goals listed on this table are chemical-specific ARARs for the Site.

Table 1: Site-Related Soil Contaminants and Remediation Goals

| Contaminant | RDCSCC (mg/kg) | NRDCSCC (mg/kg) |
|----------------------------|-----------------------|------------------------|
| Arsenic | 20 | 20 |
| Bis(2-ethylhexyl)phthalate | 49 | 210 |
| Chrysene | 9 | 40 |
| Copper | 600 | 600 |

| | | |
|----------|-----|-----|
| Lead | 400 | 600 |
| Mercury | 14 | 270 |
| Thallium | 2 | 2 |

RDCSCC = New Jersey Residential Direct Contact Soil Cleanup Criteria

NRDCSCC = New Jersey Non-Residential Direct Contact Soil Cleanup Criteria

The ROD included soil remediation goals for both residential future use and non-residential (commercial/industrial) future use. As stated below in the summary of the components of the remedy, if successful negotiations with the property owners did not allow for deed notices and remediation to the non-residential concentrations, then soils would be remediated to residential levels.

In addition, the ROD concluded that, with proper monitoring of indoor air concentrations within the Wolf Warehouse, the building foundation served as an adequate barrier preventing exposure to the mercury-contaminated material underneath. The ROD also concluded that there were not adequate controls to prevent movement of contaminated groundwater from under the buildings, as discussed below.

The remediation goals for groundwater are the New Jersey Ground Water Remediation Standards, and are provided in the table below.

| Contaminant | NJ Ground Water Remediation Standard (ug/L) |
|-------------|---|
| Arsenic | 3 |
| Benzene | 1 |
| Mercury | 2 |

Selected Remedy:

Soil Component

The soil component of the remedy includes excavation of all mercury-contaminated soil with levels above 620 mg/kg, excavation of site-related contaminants to the RDCSCC on the Lin-Mor property, capping and institutional controls. The concentration of 62 mg/kg is a risk-based concentration developed for this site and was determined to be associated with a hazard quotient of 1, and the concentration of 620 mg/kg was identified as a level consistent with principal threat waste (PTW), roughly an order of magnitude greater than the acceptable level for risk. Therefore, concentrations associated with PTW were targeted for excavation and off-site disposal.

This alternative consists of the following:

- Excavation of all mercury-contaminated soil above 620 mg/kg (approximately 7,150 cubic yards of soil) and off-site disposal of that soil, subsequent to any necessary treatment.
- Excavation of site-related contaminants on the Lin-Mor property to the RDCSCC. If the property owners of Lin-Mor agree to the placement of a deed notice, then excavation to the RDCSCC will not be required; however, a deed notice will be required.

- Capping areas and/or maintenance of the existing caps (i.e., parking lots and building foundations) with contamination in soil above the NRDCSCC of 270 mg/kg Hg. This applied to all properties that do not get a deed notice.
- Soil within the 55-foot buffer area adjacent to Berry's Creek, the Diamond Shamrock/Henkel (north) Ditch, and the West Ditch will be excavated and that soil may be placed under the cap in the undeveloped area. Certified clean fill will be placed in the buffer areas and native vegetation and erosion controls will be installed.
- Soil will be excavated from West Ditch to promote proper drainage and remove contaminated soil. Specific details of the excavation depth, liner design and installation (if necessary), depth of certified clean fill placed into the ditch, and soil management will be determined during the design phase of the project.
- The drain line within the undeveloped area will be located and removed (if it exists) before installation of the cap.
- Deed notices will be required on all properties with contaminated soil exceeding the NJDEP Residential Direct Contact Soil Cleanup Criteria. If a deed notice(s) cannot be negotiated with a property owner(s), then all soil contamination above NJDEP Residential Direct Contact Soil Cleanup Criteria must be removed on that particular property or properties.
- To ensure the remedy is protective of surface water, monitoring of contaminant flux from groundwater to surface water and sediment will occur.

Groundwater Component:

- A vertical hydraulic barrier system will be installed to serve as a physical barrier to groundwater flow and to encapsulate the areas of highest mercury concentrations under the Wolf Warehouse. The hydraulic barrier will be keyed approximately 2 feet into the confining layer underlying the site at a depth of approximately 20 feet. Figure 2 identifies the location of the hydraulic barrier. Soil generated from the installation of the hydraulic barrier (approximately 1,650 cubic yards) will be placed under the cap in the undeveloped area.
- Groundwater use restrictions will be placed on the extent of the groundwater contamination plume in the form of a Classification Exception Area and a Well Restriction Area to prevent use of contaminated groundwater.
- Groundwater monitoring will be conducted to determine if hydraulic controls within the barrier are required. If required, hydraulic controls will be implemented. Groundwater monitoring will also be conducted to ensure the hydraulic barrier is effective. The monitoring requirements will be determined during design.

Status of Implementation

The Potentially Responsible Parties (PRPs), Morton International (a corporate successor to Ventron, which is a fully-owned subsidiary of Rohm and Haas, which is owned by Dow Chemical) and the Fruit

of the Loom Settlement Agreement Custodial Trust, conducted the remediation of the site. In October 2008, NJDEP, while still acting as the lead agency, oversaw some initial field activities such as site clearing, drum removal and establishing air monitoring stations.

EPA assumed the lead agency role in 2009. Construction of the selected remedy began on March 16, 2009 with oversight conducted for EPA by the U. S. Army Corps of Engineers. The construction started with the undeveloped portion of the site. Several areas requiring off-site disposal of mercury (soils with concentrations greater than 620 ppm mercury) were excavated, and sent to a transfer facility for off-site disposal via rail. Sheet pile was driven to facilitate deeper excavation and was removed prior to capping. Soils and debris with concentrations less than 620 ppm mercury were returned to the excavations. Deed notices were entered for all properties that would have contamination remaining above the NJ RDCSCC (all properties except Lin-Mor). Clean fill was brought in to bring the cap to design grades. Perimeter air monitoring was conducted throughout the construction period, with actions taken to mitigate any exceedances.

A removal action of sediment from the area in the vicinity of the West Riser Tide Gate was also conducted in conjunction with the remediation at Ventron/Velsicol OU1 in the fall of 2009.

After a period of demobilization during the winter, site remediation continued through 2010, including the installation of the verticle barrier wall and the grading and placement of the cap as required by the 2006 ROD. Demobilization was complete on December 10, 2010. The RA for OU1 was completed in October 2012 with EPA's acceptance of the RA report.

IC Summary Table

Table 2: Summary of Planned and/or Implemented ICs

| Media, engineered controls, and areas that do not support UU/UE based on current conditions | ICs Needed | ICs Called for in the Decision Documents | Impacted Parcel(s) | IC Objective | Title of IC Instrument Implemented and Date (or planned) |
|--|-------------------|---|---------------------------|---|---|
| Soil | Yes | Yes | Undeveloped Area | Use restricted to industrial/commercial | Deed Notice |
| Soil | Yes | Yes | Wolf Warehouse | Use restricted to industrial/commercial | Deed Notice |
| Soil | Yes | Yes | US Life Warehouse | Use restricted to industrial/commercial | Deed Notice |
| Soil | Yes | Yes | Blum Property | Use restricted to industrial/commercial | Deed Notice |

| | | | | | |
|-------------|-----|-----|-------------------------------|--|-------------------------------|
| Soil | Yes | Yes | Ethyl Boulevard | Use restricted to industrial/commercial (street) | Deed Notice |
| Soil | Yes | Yes | Norfolk Southern Railroad | Use restricted to industrial/commercial (railroad) | Deed Notice |
| Soil | Yes | Yes | EJB Property (Ready Raw) | Use restricted to industrial/commercial | Deed Notice |
| Soil | Yes | Yes | Prince Packaging | Use restricted to industrial/commercial | Deed Notice |
| Groundwater | Yes | Yes | Classification Exception Area | Restrict installation of groundwater wells and groundwater use | Classification Exception Area |
| Groundwater | Yes | Yes | Well Restriction Area | Restrict installation of groundwater wells and groundwater use | Well Restriction Area |

Systems Operations/Operation & Maintenance

Site operation and maintenance (O&M) has occurred since 2012. Monitoring identified in the plan includes: contaminant flux monitoring; air quality monitoring in the Wolf warehouse; Classification Exception Area (CEA) sampling; and sampling to confirm vertical barrier wall effectiveness. In addition the following inspections are conducted: deed notice properties (signs of disturbance) ; general site inspection; developed area caps inspection; undeveloped area cap inspection; vertical hydraulic barrier wall inspection; storm water controls; West Ditch and 55-foot buffer inspection; and engineering controls maintenance.

Groundwater samples are collected at eight outside wells surrounding the barrier wall at the Wolf Warehouse and sampled for total and dissolved mercury and arsenic, as well as benzene. (refer to Figure 2). Since the vertical barrier was constructed, water levels have been higher than anticipated within the vertical containment barrier, requiring more frequent pumping and treatment of water from within the barrier than originally expected. In an effort to address this issue, relief vents have been installed near a portion of the vertical barrier to allow groundwater under artesian conditions to discharge near the surface water collection areas and be removed through surface drainage.

Potential site impacts from climate change have been assessed, and the performance of the remedy may be impacted by the following climate change effects in the region and near the site. The Ventron/Velsicol site is low-lying and adjacent to Berry's Creek, so it has the potential to be impacted by

increased storm intensities and frequencies as a result of climate change. However, in the last six years, the site experienced three larger-than-average storms: Hurricane Irene, Tropical Storm Lee and Hurricane Sandy, sustaining only minor disturbances. Continued monitoring of caps and the effectiveness of the barrier wall will ensure the remedy functions and remains protective into the future. Construction of a warehouse on the undeveloped portion of the site includes bringing in clean fill material and raising the elevation of the ground surface, which will further limit potential storm impacts.

III. PROGRESS SINCE THE LAST REVIEW

This is the first FYR for the site.

IV. FIVE-YEAR REVIEW PROCESS

Community Notification, Involvement & Site Interviews

On November 14, 2016, EPA Region 2 posted a notice on its website indicating that it would be reviewing site cleanups and remedies at 38 Superfund sites in New York and New Jersey, including the Ventron/Velsicol site. The announcement can be found at the following web address: https://www.epa.gov/sites/production/files/2016-11/documents/five_year_reviews_fy2017_final.pdf.

In addition to this notification, a public notice was made available via email to the Towns of Wood-Ridge and Carlstadt, New Jersey, on February 3, 2017, with a request that the notice be posted to the towns' websites. The notice was also posted to EPA's webpage for the Ventron/Velsicol site. The purpose of the public notice was to inform the community about the FYR and to list where the final report will be posted. The notice also included the RPM and the CIC address and telephone numbers for questions or comments related to the five-year review process or the site. Once the FYR is completed, the results will be made available on EPA's Ventron/Velsicol webpage and at EPA's Public Reading Room at 290 Broadway, New York, New York.

Site Inspection

The inspection of the Site was conducted on 6/29/2017. In attendance were Douglas Tomchuk of EPA, Richard Simun and Pravin Punamiya of Parsons (representing Morton), David Heidlauf of Ramboll Environ (representing the Fruit of the Loom Settlement Agreement Custodial Trust). In addition, Deven Schmitt of Bridge Development Partners, the company constructing a new warehouse on the undeveloped portion of the site, attended.

The inspection team first viewed the area where the pressure relief vents were installed to reduce potential of groundwater accumulation within the vertical barrier wall. The inspection team then walked the perimeter of the soil cover over the undeveloped area. The focus was on the ongoing site preparations for construction of a new warehouse. No issues were identified during this inspection.

Interviews:

During the FYR process, interviews were conducted to document any perceived problems or successes with the remedy that has been implemented to date. The results of these interviews are summarized below:

Gwen Zervas – NJDEP Project Manager

Overall, NJDEP was satisfied that the remedy is protective. NJDEP had concerns regarding the certification of fill being brought in for the construction of the warehouse on the undeveloped portion of the site. NJDEP's concern has been satisfied by reviewing the data that confirmed the clean fill.

Robert Casselberry – Dow Chemical (representing Morton International)

Morton implemented the remedy and has been conducting the O&M at the site. Morton is still the point of contact for EPA, even though Bridge Construction is the company developing the undeveloped portion of the site. Morton will maintain that role even as the property ownership is transferred. Morton has been active in addressing the artesian conditions causing high water levels within the vertical barrier wall, and frequent shipment of water for off-site treatment. Morton is satisfied that the remedy is protective.

Data Review

Following the construction of the multi-component remedy, which included a vertical barrier wall around the Wolf Warehouse building, a 55-foot clean soil buffer around the perimeter of the undeveloped area, and a soil cover, a network of existing and new wells and piezometers was developed for monitoring groundwater quality and water levels.

Groundwater Sampling Results

In summary, six of the wells outside the barrier wall had at least one exceedance of the groundwater standard for total mercury (2 ug/L) between 2012 and 2015; however, only one well (BW-MW-8) had one exceedance in 2012 for dissolved mercury.

Concentration trends for the eight barrier wall wells were developed using Mann-Kendall statistical analysis of total and dissolved mercury. Observed trends were classified as stable or no trend, except for BW-MW-2 (increasing), BW-MW-6 (increasing), and BW-MW-8 (decreasing). Although well BW-MW-4 was classified as no trend, total mercury exceeded the groundwater standard during eight of the ten sampling rounds. Well BW-MW-2 has a statistically increasing trend, but only the 2015 sample exceeded the groundwater standard and the dissolved mercury concentration (0.22 ug/L) remains below the groundwater standard. Well BW-MW-6 also has a statistically increasing trend, but only two samples slightly exceeded the groundwater standard and all the dissolved mercury concentrations also remain below the groundwater standard.

Well BW-MW-8 (12 feet deep), located between the Wolf and US Life warehouses, has had the highest total mercury concentrations (up to 19 ug/L in 2012); but the Mann-Kendall trend currently is classified as decreasing. Nearby well BW-MW-7 (12 feet deep), is about 120 feet further south between the warehouses and has had only one detectable total mercury concentration (0.37 ug/L) during the last ten sampling rounds.

Twelve wells installed in the undeveloped area were sampled from 2011-2015 for the three site groundwater COCs: arsenic, mercury, and benzene. Total mercury concentrations were less than the groundwater standard (2 ug/L) in ten of the twelve undeveloped-area wells. Arsenic concentrations were more variable, with several exceedances of the groundwater standard (3 ug/L). Benzene only exceeded the groundwater standard (1 ug/L) in two of the twelve undeveloped-area wells.

Well CF-MW-1 is located near the railroad tracks in the northern part of the property; arsenic concentrations ranged from 3 to 25 ug/L. The other eleven undeveloped-area wells are just inside the 55-foot clean buffer adjacent to Berry's Creek, the Diamond Shamrock/Henkel (north) Ditch, and the West Ditch. Wells CF-MW-2, CR-MW-3, and CF-MW-4 are along Berry's Creek, and have had maximum arsenic concentrations of 23, 18, and 16 ug/L, respectively. Wells CF-MW-5, CF-MW-6, and CF-MW-7 are in the southeastern part of the undeveloped property and have not exceeded the arsenic or benzene standards, but have had a few exceedances for mercury. Wells CF-MW-8, CF-MW-9, and CF-MW-10 are along the Henkel Ditch and have had some sporadic exceedances of arsenic and benzene and one exceedance for total mercury. CF-MW-11 and CF-MW-12, along the West Ditch, each had one exceedance of arsenic standard in 2012.

Groundwater to Surface Water Flux

In addition to comparison to groundwater standards, the PRPs conducted an evaluation that estimated the groundwater mass flux of the three COCs to the adjacent surface-water bodies and quantified the potential effects on the surface water, using a "Mass-Flux Toolkit" model. The overall results of the calculations indicate that the potential contribution from groundwater discharge to concentrations in surface water is increased by less than 0.004 ug/L for all three COCs.

Vertical Barrier Wall Performance

The PRPs also conducted a hydraulic evaluation of the effectiveness of the Vertical Barrier Wall. The eight wells outside the Barrier Wall were paired with eight corresponding piezometers (BW-PZ-1 to -8) inside the wall, and groundwater levels are measured quarterly. The potential for groundwater overtopping the wall is present along the northwestern part of the wall. Water levels in outside wells BW-MW-7 and BW-PZ-8 are above the elevation of the top of the vertical wall and are higher than in their paired piezometers (BW-PZ-7 and BW-PZ-8), indicating that groundwater flow is directed inward. Subsequent investigations have included a) evaluating the effects of pumping to bring down water levels, b) monitoring continuous water levels in piezometers for selected periods of time, and c) conducting a dye tracer test. Dye was injected into outside wells BW-MW-7 and BW-MW-8 and dye was detected in samples of the interior groundwater. The PRP is implementing additional steps to mitigate the wall overtopping condition.

V. TECHNICAL ASSESSMENT

QUESTION A: Is the remedy functioning as intended by the decision documents?

Question A Summary:

The remedy selected in the 2006 Record of Decision (ROD) involved excavation of contaminated soil and capping and a clean buffer zone between the capped areas and the wetlands. The ROD also specified a vertical barrier wall to prevent/minimize the potential downgradient and off-site migration of contaminated groundwater to the marsh area and Berry's Creek.

Overall, it appears that the remedy is functioning as intended by the decision documents, with contamination either removed or contained on site. Based on the review of the Operation, Maintenance, and Monitoring Reports and the RA report, it appears that the implemented remedy has removed all

contaminated soils above cleanup levels specified in the ROD and containment remedies are functioning as intended.

Operation and maintenance activities include groundwater monitoring, assessment of groundwater to surface water contaminant flux, and groundwater level measurements to ensure the vertical engineered barrier is functioning as intended. Activities conducted to date indicate that total mercury concentrations were less than the groundwater standard (2 ug/L) in ten of the twelve undeveloped-area wells. Arsenic concentrations were more variable, with several exceedances of the groundwater standard (3 ug/L). Benzene only exceeded the groundwater standard (1 ug/L) in two of the twelve undeveloped-area wells. Groundwater flux modeling indicates that there is little increase in groundwater contaminant discharge to surface water. In addition, groundwater level measurements indicate that groundwater mounding occurs in the northwestern part of the vertical barrier wall. Additional groundwater pumping and investigation will be conducted to mitigate this issue.

Also, given the disturbances associated with the construction of a warehouse on the undeveloped portion of the property, evaluation of redistribution of contamination from below the cap should be conducted post construction – to ensure a clean surface is maintained at completion.

Humans are not exposed to contaminants in groundwater currently because all nearby receptors are using the municipal water supply and a CEA/WRA is in place to prohibit the installation of future drinking water wells. Deed notices on properties with soils above NJ RDCSCC concentrations have been put in place for the Wolf Warehouse; U.S. Life Warehouse (Reddy Raw); Undeveloped Area; Prince Packing; Blum; EJB; Ethel Boulevard; and Norfolk Southern Railroad. The deed notices maintain the properties as industrial/commercial and prevent disturbance of underlying soil with notification of NJDEP.

QUESTION B: Are the exposure assumptions, toxicity data, cleanup levels, and remedial action objectives (RAOs) used at the time of the remedy selection still valid?

Question B Summary:

The exposed populations evaluated as part of the 2006 OU1 ROD for the Site remain appropriate currently and for the next five years. These include: current/future onsite workers and construction workers in the developed areas and current/future trespassers/visitors, future onsite workers and future construction workers in the undeveloped areas as well as future residents (groundwater only). Exposure pathways (described on pages 5 to 6) remain valid.

For several COCs, soil toxicity values and as a result, NJDEP residential and non-residential direct contact soil remediation standards (cleanup goals; superseding the previous soil cleanup criteria) have changed since the time of the ROD. All have become less stringent except: arsenic went from 20 to 19 mg/kg (both residential and nonresidential); bis(2-ethylhexyl)phthalate went from 49 to 35 mg/kg for residential and 210 to 140 mg/kg for nonresidential; and mercury (elemental) went from 270 to 65 mg/kg for nonresidential. Though these cleanup goals have become more conservative, for arsenic, the value is not health-based but rather a State background level for soils and the distinction between 19 and 20 mg/kg is insignificant. Bis(2-ethylhexyl)phthalate is a carcinogen; the updated standard is within the acceptable risk range. As a result, these toxicity values remain valid. Mercury; however, is a noncarcinogen and evaluated differently.

Much of the mercury-contaminated soils were excavated (principal threat waste in the undeveloped area, concentrations above NJDEP RDCSCC at the Lin-Mor property, concentrations above NJDEP NRDCSCC at the Norfolk Southern Railroad property, soils within a buffer zone of on-site water bodies/ditches and the West Ditch) and covered with certified clean fill or capped as a result of the ROD. The average post-excavation mercury concentration on the Lin-Mor property was 4.6 mg/kg based on data provided in the Compiled Remedial Action Report. This is below the RDCSCC of 14 mg/kg in the ROD. In those areas where contaminated soil remains above the RDCSCC, a deed notice was placed. The only area of the site where the NRDCSCC was used as a cleanup goal was in the railroad proper. The excavations ranged in depth from 2-4 feet below ground surface with clean fill brought in. While vertically it is unlikely that direct contact exposures would occur, horizontally, the extent of contamination based on the previous cleanup goal may have left some contaminated soils in place between 65 mg/kg (NRDCSRS) and 270 mg/kg (NRDSCC). It is highly unlikely that exposure durations and frequencies in these limited areas of residual contamination would be enough to result in an unacceptable health hazard.

Lead was identified as a contaminant of concern in the ROD. EPA issued a new lead memorandum in December of 2016 (OLEM Directive 9200.2-167) which indicates that a blood lead level (BLL) of 10 ug/dL may no longer be protective. Current scientific information indicates that adverse health effects are evident with blood lead levels between 2 and 8 µg/dL. A target blood lead level of 5 µg/dL reflects current scientific literature on lead toxicology and epidemiology that provides evidence that the adverse health effects of lead exposure do not have a threshold. Cleanup goals for lead were 400 mg/kg based on the RDCSCC (equivalent to the current RDCSRS) and 600 mg/kg for NDCSCC (the NDCSRS is now 800 mg/kg). Based on the results of the Adult Lead Methodology in the risk assessment, in the developed area, average lead concentrations ranged from 112 to 213 mg/kg so this area does not pose an unacceptable health hazard. In the undeveloped area (depending on whether an outlier sample was included), soil lead concentration ranged from 642 to 2,110 mg/kg. Much of the lead-contaminated soils in the undeveloped area were excavated or capped, along with mercury-contaminated soils. Post-excavation sampling from the 2011 Remedial Action Report indicate that the average lead concentration on the Lin-Mor property was 286 mg/kg. Because the site is currently zoned for commercial/industrial use and is not expected to change in the next five years, the NDCSCC cleanup goal remains protective as changes to the Adult Lead Methodology (ALM) model would result in a cleanup goal higher than 600 mg/kg. Residential exposure is not anticipated in the future based on the deed restrictions on the property.

RAOs for groundwater included: 1) Prevent/minimize the potential downgradient and off-site migration of contaminated groundwater to the marsh area and Berry's Creek and 2) Reduce human and ecological receptor's potential exposure to contaminants in groundwater to within acceptable levels. These RAOs remain valid.

The RAOs for soil were as follows: 1) Prevent/minimize the potential migration of contaminants in surface soil via windblown dust and surface runoff to the marsh area and Berry's Creek; 2) Prevent/minimize potential migration of contamination to groundwater, which may discharge to surface water and sediment; 3) prevent/minimize potential migration of contamination in on-site sediments via surface water runoff to the marsh or Berry's Creek; 4) Reduce human and ecological receptor's exposure to contamination in surface soil to within acceptable risk levels and 5) Reduce exposure to contamination in soil in the undeveloped area to allow for reasonable and anticipated land use. These RAOs remain valid currently and within the next five years.

Although the ecological risk assessment screening and toxicity values used to support the 2006 ROD may not necessarily reflect the current values, the excavation and capping of the contaminated soil eliminated any potential risk from surface soil contaminants to terrestrial receptors. Potential ecological risks associated with sediment and surface water are being addressed separately with the current investigation of Berry's Creek. OU2, the Berry's Creek Study Area remains under investigation and was not evaluated as part of this five-year review.

As part of the BHHRA, the vapor intrusion pathway was considered for future long-term workers in both the developed and undeveloped areas of the site. Unacceptable noncancer hazard was identified for future long-term worker exposure to naphthalene (HI = 4.8) as a result of vapor intrusion.

For this FYR, an updated evaluation of vapor intrusion was performed using the EPA online vapor intrusion screening level (VISL) calculator. Only two volatile COCs are part of the biennial certification groundwater monitoring program: benzene and mercury. Using the maximum detected concentrations for each (i.e., 1.3 ug/L benzene and 41 ug/L mercury) from the Operation, Maintenance and Monitoring reports in the last five years as well as the naphthalene concentration used in the BHHRA model (44 ug/L), current cancer risks and noncancer hazards were computed. The results indicate that only mercury in its elemental form has the potential to result in unacceptable risk via the vapor intrusion pathway (HI = 11).

Mercury vapor is currently being monitored inside the Wolf Warehouse building, as the building's foundation serves as a cap to buried mercury contamination in soils. The maximum indoor air concentration in this reporting period (129 ng/m³ or 0.13 ug/m³) is an order of magnitude below the EPA composite worker air RSL (1.3 ug/m³) and the NJDEP Rapid Action Level for Nonresidential Indoor Air (2 ug/m³). Indoor air will continue to be monitored as part of the remedy.

Further, the site is currently undergoing redevelopment. Future construction needs to consider the potential for vapor intrusion. The new construction is anticipated to include a vapor barrier in the building design. Indoor air should be sampled after the building is constructed to verify that the system is working as intended. Appropriate documentation (*e.g.*, as-built drawings) of the installation of the vapor barrier should be provided after the construction is completed.

QUESTION C: Has any other information come to light that could call into question the protectiveness of the remedy?

No

VI. ISSUES/RECOMMENDATIONS

| Issues/Recommendations | |
|---|--|
| OU(s) without Issues/Recommendations Identified in the Five-Year Review: | |
| None | |

| |
|---|
| Issues and Recommendations Identified in the Five-Year Review: |
|---|

| | | | | |
|--------------------------------------|--|--------------------------|------------------------|-----------------------|
| OU(s): OUI | Issue Category: Operations and Maintenance | | | |
| | Issue: Artesian conditions causing high water levels within vertical barrier wall | | | |
| | Recommendation: Continue monitoring effectiveness of vents in reducing water accumulation inside vertical barrier wall and transportation of water to off-site treatment facility as necessary. | | | |
| Affect Current Protectiveness | Affect Future Protectiveness | Party Responsible | Oversight Party | Milestone Date |
| No | Yes | PRP | EPA | 6/30/2020 |

| | | | | |
|--------------------------------------|---|--------------------------|------------------------|-----------------------|
| OU(s): OUI | Issue Category: Changed Site Conditions | | | |
| | Issue: Construction of warehouse and parking areas | | | |
| | Recommendation: Provide assurance that contamination that was below the soil cover previously implemented has not be exposed by construction of warehouse. | | | |
| Affect Current Protectiveness | Affect Future Protectiveness | Party Responsible | Oversight Party | Milestone Date |
| No | Yes | PRP | EPA | 6/30/2020 |

OTHER FINDINGS

In addition, the following are observations that were made during the FYR and may improve management of O&M, but do not affect current and/or future protectiveness:

- During the site inspection for the FYR a groundhog was observed. Surveillance for and filling of burrows should be conducted during routine inspections of capped areas.
- Site monitoring reports noted that invasive species were found in the buffer zone. Mitigation approaches should be developed to help maintain the native species.

VII. PROTECTIVENESS STATEMENT

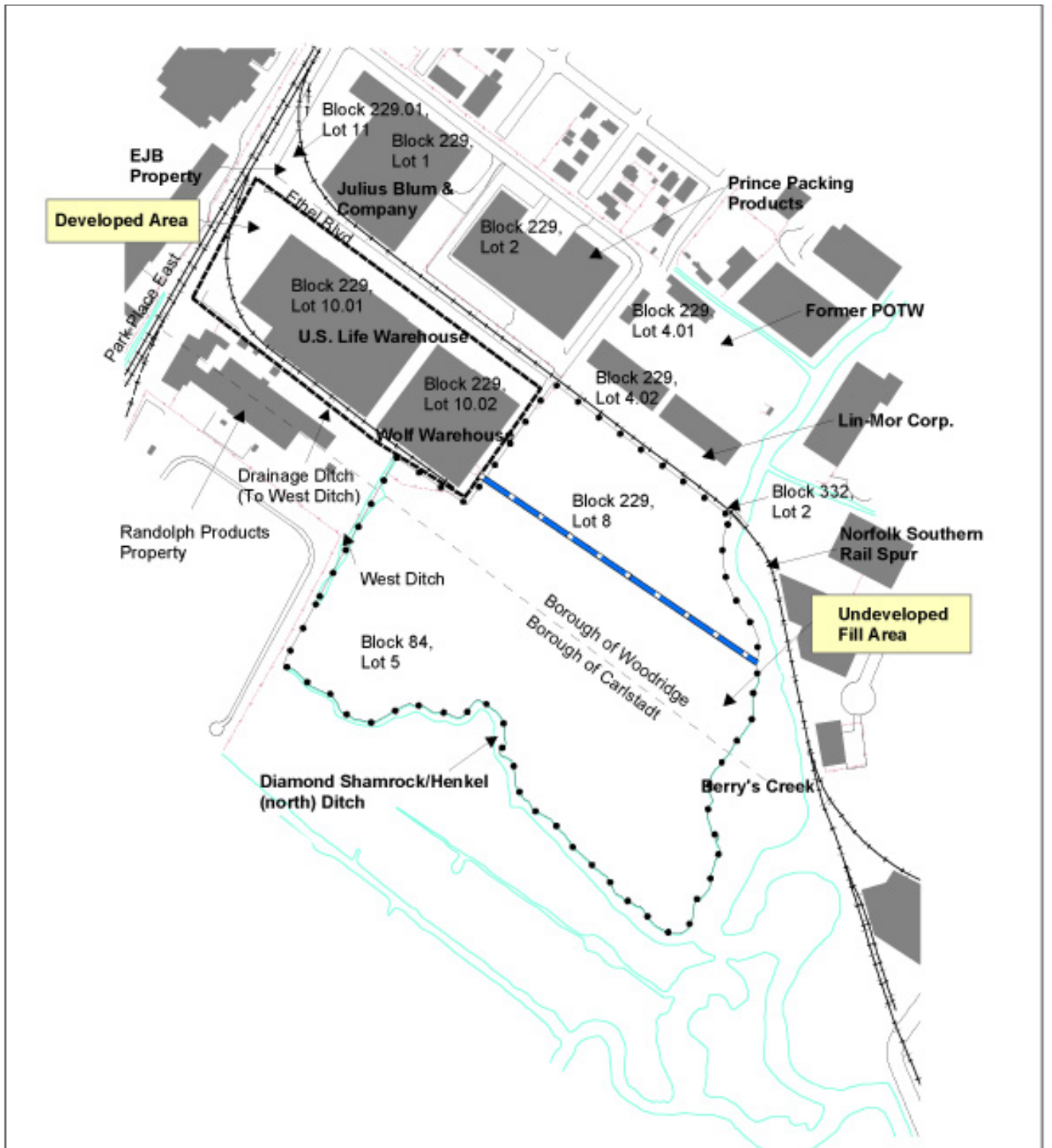
| Protectiveness Statement(s) | | |
|--|---|---|
| <i>Operable Unit:</i> OU1 | <i>Protectiveness Determination:</i> Short-term Protective | <i>Planned Addendum Completion Date:</i> 6/30/2020 |
| The remedy at OU1 currently protects human health and the environment because the direct contact pathway has been eliminated, and groundwater is not utilized at the site. However, in order for the remedy to be protective in the long-term, excess water entering the vertical barrier wall needs to be controlled to ensure protectiveness. In addition, the construction of the warehouse needs to be conducted in a manner to maintain a clean soil surface upon completion of the construction. | | |

VIII. NEXT REVIEW

The next FYR report for the Ventron/Velsicol Superfund Site is required five years from the completion date of this review.

APPENDIX A – REFERENCE LIST

| | |
|---|-------------------|
| Record of Decision – Ventron/Velsicol Site (OU1) | October 30, 2006 |
| Ground Water Classification Exception Area Report, Ventron/Velsicol Superfund Site, Operable Unit 1 Wood-Ridge and Carlstadt, New Jersey | April 6, 2007 |
| Addendum 1 - “Ground Water Classification Exception Area Report, Ventron/Velsicol Superfund Site, Operable Unit 1 Wood-Ridge and Carlstadt, New Jersey April 6, 2007” | November 14, 2007 |
| Remedial Action Report | April 15, 2011 |
| Remedial Action Report approval letter | October 12, 2012 |
| Operation,Maintenance & Monitoring Report 2014 | April 2015 |
| Operation,Maintenance & Monitoring Report 2015 | April 2016 |
| Operation,Maintenance & Monitoring Report 2016 | June 2017 |



Legend

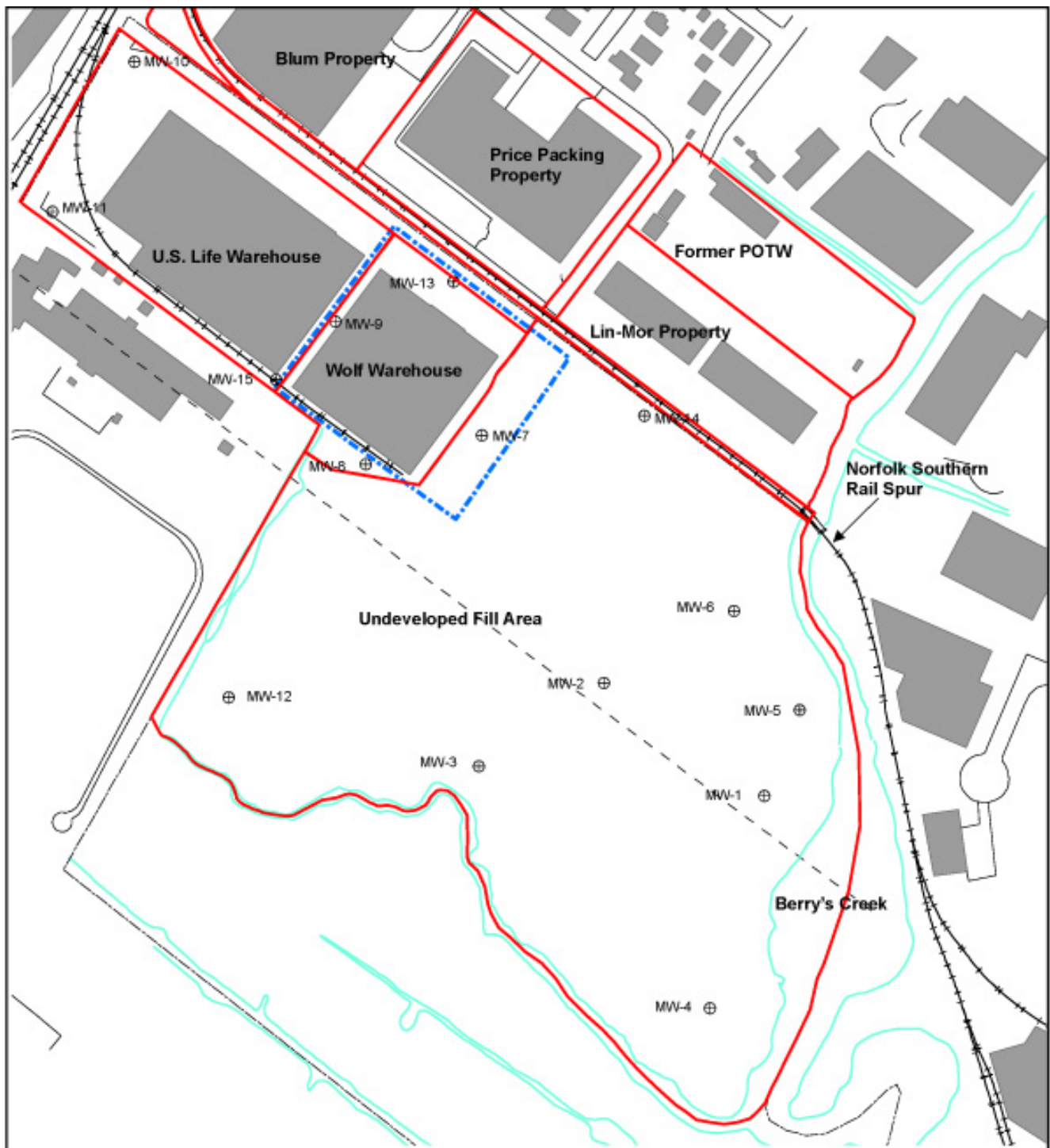
- Streams
- Roads
- Railroad
- Fence
- - - Borough Boundary
- - ● OU1 FS Boundary--Undeveloped Area
- - - OU1 FS Boundary--Developed Area
- Approximate Location of Historical Discharge Pipe



0 165 330 Feet

Figure 1
Site Map
Operable Unit 1
Ventron/Velsicol Superfund Site
June 16, 2006

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Legend

- Property Boundary
- Streams
- Roads
- +— Railroad
- - - Site Boundary
- - - Borough Boundary
- ⊕ Monitoring Wells
- - - - - Vertical Hydraulic Barrier Alignment
- Existing Buildings

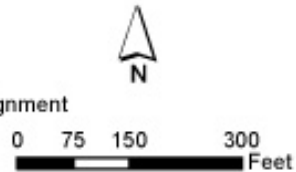


Figure 2
 Groundwater Alternative G5 -
 Vertical Hydraulic Barrier
 Ventron/Velsicol Superfund Site
 OU 1 Feasibility Study
 April 06, 2006

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